

Claims

- [c1] 1. A profile control system, for controlling a profile of a polishing pad, adapted in a chemical mechanical polishing apparatus, the chemical mechanical polishing apparatus comprising a polishing pad having a transparent region, a polishing table, a polishing head and a conditioner, the profile control system comprising:
- at least one illuminant, configured in the polishing table, wherein the illuminant is positioned in the polishing table corresponding to the transparent region of the polishing pad;
- a detector, configured over the polishing pad for detecting a light passing through the transparent region of the polishing pad; and
- a processor, adapted to evaluate a thickness and a profile of the polishing pad and transmits a processing signal to the conditioner according to the thickness and the profile determined by the processor for adjusting a processing recipe of the conditioner to reduce a differential thickness between a central portion of the polishing pad and a peripheral portion thereof.
- [c2] 2. The profile control system for controlling a profile of a

polishing pad of claim 1, wherein the illuminant is configured with a linear illuminant region along a radial direction of the polishing table.

[c3] 3. The profile control system for controlling a profile of a polishing pad of claim 2, wherein the illuminant comprises a strip illuminant or a plurality of spot illuminants.

[c4] 4. The profile control system for controlling a profile of a polishing pad of claim 1, wherein the processor determines a thickness of the polishing pad by detecting an area of the transparent region via the detector for determining a local polishing condition thereof.

[c5] 5. The profile control system for controlling a profile of a polishing pad of claim 1, wherein the illuminant comprises a luminescence illuminant.

[c6] 6. The profile control system for controlling a profile of a polishing pad of claim 1, wherein the detector is disposed on a robot, which is adapted to move the polishing head.

[c7] 7. A chemical mechanical polishing apparatus, adapted for polishing a wafer, comprising:
a polishing table, having at least one illuminant;
a polishing pad, covering the polishing table, wherein the polishing pad has at least one transparent region

corresponding to the illuminant of the polishing table;
a detector, configured over the polishing pad for detecting a light passing through the transparent region of the polishing pad;
a processor, coupled to the detector, adapted to evaluate a thickness and a profile of the polishing pad and transmit a processing signal according to the thickness and the profile determined by the processor;
a conditioner, configured over the polishing pad and coupled to the processor, wherein the conditioner is adapted to adjust a processing recipe according to the processing signal from the processor to reduce a differential thickness between a central portion of the polishing pad and a peripheral portion thereof; and
a polishing head, configured over the polishing pad and beside the conditioner for holding the wafer.

[c8] 8. The chemical mechanical polishing apparatus of claim 7, wherein the illuminant is configured in a linear illuminant region along a radial direction of the polishing table.

[c9] 9. The chemical mechanical polishing apparatus of claim 8, wherein the illuminant comprises a strip illuminant or a plurality of spot illuminants.

[c10] 10. The chemical mechanical polishing apparatus of

claim 7, wherein the processor determines the thickness of the polishing pad by detecting an area of the transparent region via the detector for determining a local polishing condition thereof.

- [c11] 11. The chemical mechanical polishing apparatus of claim 7, wherein the illuminant comprises a luminescence illuminant.
- [c12] 12. The chemical mechanical polishing apparatus of claim 7, further comprising a robot over the polishing pad and connected to the polishing head for moving the polishing head.
- [c13] 13. The chemical mechanical polishing apparatus of claim 12, wherein the detector is disposed on the robot.
- [c14] 14. The chemical mechanical polishing apparatus of claim 7, further comprising a robot over the polishing pad and connected to the conditioner for moving the conditioner.
- [c15] 15. A chemical mechanical polishing apparatus, adapted for polishing a plurality of wafers, comprising:
 - a plurality of polishing tables, each having at least one illuminant;
 - a plurality of polishing pads covering the polishing tables, wherein each of the polishing pads has at least one

transparent region corresponding to the each illuminant of the polishing tables;
a plurality of detectors, configured over the polishing pad for detecting a light passing through the transparent regions of the polishing pads;
a processor, coupled to the detectors, adapted to evaluate thickness and profiles of the polishing pads and transmit a plurality of processing signals according to the thickness and the profiles determined by the processor;
a plurality of conditioners, configured over the polishing pads and coupled to the processor, wherein the conditioners are adapted to adjust processing recipes according to the processing signals from the processor to reduce a differential thickness between a central portion of the polishing pads and a peripheral portion thereof; and
a plurality of polishing heads, configured over the polishing heads and beside the conditioners for holding the wafers.

[c16] 16. The chemical mechanical polishing apparatus of claim 15, wherein each the illuminants are configured in each linear illuminant region along a radial direction of the polishing tables.

[c17] 17. The chemical mechanical polishing apparatus of claim 16, wherein the each illuminant comprises a strip

illuminant or a plurality of spot illuminants.

- [c18] 18. The chemical mechanical polishing apparatus of claim 15, wherein the processor determines the thickness of the polishing pads by detecting areas of the transparent regions via the detectors for determining local polishing conditions thereof.
- [c19] 19. The chemical mechanical polishing apparatus of claim 15, wherein the each illuminant comprises a luminescence illuminant.
- [c20] 20. The chemical mechanical polishing apparatus of claim 15, further comprising a robot over the polishing pads and connected to the polishing heads for moving the polishing heads.
- [c21] 21. The chemical mechanical polishing apparatus of claim 20, wherein the detectors is disposed on the robot.
- [c22] 22. The chemical mechanical polishing apparatus of claim 15, further comprises a plurality of robots over the polishing pad and connected to the conditioners for moving the conditioners.
- [c23] 23. A method of controlling a profile of a polishing pad, adapted in a chemical mechanical polishing apparatus, the method comprising:

using a detector for detecting a light from a polishing table passing through the polishing pad;
using a processor for determining a thickness of the polishing pad and transmitting a processing signal according to the thickness determined by the processor; and
adjusting the processing recipe of the conditioner according to the processing signal from the processor for reducing a differential thickness between a central portion of the polishing pad and a peripheral portion thereof.

[c24] 24. The method of controlling a profile of a polishing pad of claim 23, further comprising a step of adjusting the polishing pad using the conditioner for increasing a dressing amount after adjusting the processing recipe of the conditioner.

[c25] 25. The method of controlling a profile of a polishing pad of claim 23, further comprising a step of adjusting the polishing pad using the conditioner for reducing a dressing amount after adjusting the processing recipe of the conditioner.

[c26] 26. The method of controlling a profile of a polishing pad of claim 23, wherein the step of determining the thickness of the polishing pad is performed by detecting a light from the polishing table through a transparent

region of the polishing pad to determine a local polishing condition of the polishing pad.

- [c27] 27. The method of controlling a profile of a polishing pad of claim 26, wherein the step of determining the thickness of the polishing pad is performed by detecting a light from the polishing table through a area of the transparent region of the polishing pad.
- [c28] 28. The method of controlling a profile of a polishing pad of claim 23, wherein the method is applied to an in-situ chemical mechanical polishing process.
- [c29] 29. The method of controlling polishing pad profile of claim 23, wherein the method is applied to an ex-situ chemical mechanical polishing process.